

# DESIGN AND DEVELOPMENT OF ARDUINO BASED AUTOMATIC COLOR SORTING MACHINE

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**Abstract** - Automation is the technology by which a method or procedure is performed without human help. Automation or automatic management is the use of assorted management systems for in operation instrumentation like machinery, processes in factories, boilers and warmth treating ovens, steering and stabilization of ships, craft and different applications and vehicles with borderline or reduced human intervention. Some processes are fully automatic. Sorting an object could be a terribly tough process. Continuous manual sorting creates consistency problems. Machines will perform principally dreary assignments superior to personalities. manual laborer exhaustion on consecutive producing structures may end up in belittled execution, and purpose troubles in holding up object fine. This paper describes an operating example designed for automatic sorting of objects supporting the color. A TCS3200 Color sensor was accustomed to discovering the color of the product and also the Atmega 328 microcontroller was accustomed to managing the method. The identification of the color relies on the frequency analysis of the output of the TCS3200 device. The experimental results promise that the example can fulfill the wants for higher production and precise quality within the field of automation.

**Keywords:** Sorting, Color sensor, Automatic, Object, Microcontroller, Color etc.

## 1. INTRODUCTION

In this digital world, continuous manual sorting is a difficult and time consuming process, color processing gives us an opportunity to solve this issue in different industries. Machines can perform highly repetitive tasks better than humans. Automating many of the tasks in the industries may help to improve the efficiency of the manufacturing system. The purpose of this model is to design and implement a system which automatically separates products based on their color. To reduce human efforts on mechanical maneuvering, different types of sorting machines are being developed. A

common requirement in the field of color sorting is that of color sensing and identification. The system has the ability to sort the object according to their colors into respective coloured cups in minimum time.

## 1.1 METHODOLOGY

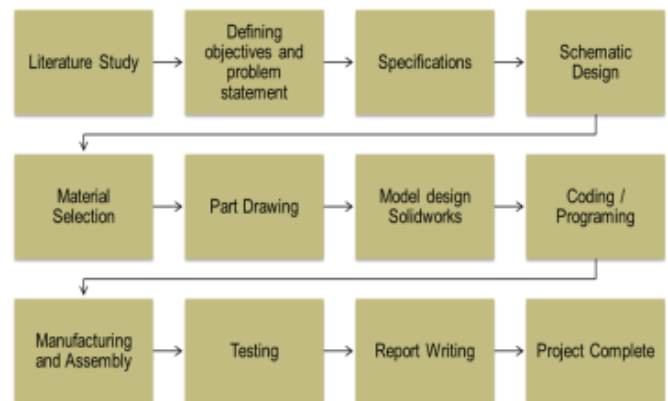


Fig -1: Methodology

## 2. LITERATURE SURVEY

This paper Review on Color object Sorting Systems Using Arduino UNO by Mr. Pratik, Bapusao Patil, Mr. M.L.Harugade[2] helps us to understand how we can make a Color Detection application using Arduino UNO and TCS3200 Color Sensor. Also Object Sorting using color Sensor and Arduino by Tushar G. Gaikar, Soham N. Zadokar, Rajendr and S.Bhandari [4], during this paper we found out how to sense multiple color by color sensor and sorted more objects using extra hardware assembly. We can use a Robotic arm to pick and place the object. From this paper, Working Principle of Arduino and using it as a tool by Leo Louis[7] we got to know about Programming of Arduino, its types and various applications.

### 3. MATERIAL PROCUREMENT

#### 3.1. SPECIFICATIONS

**Arduino NANO:** Microcontroller: atmega328, architecture: AVR, Operating voltage: 5v, Flash memory: 32 kb of which 2 kb used by bootloader, SRAM: 2 kb, Clock speed: 16 MHZ,

Analog in pins: 8, EEPROM: 1 kb, DC current per I/o pins: 40 ma(I/o pins), Input voltage: 7-12 v, Digital I/o pins: 22(6 of which are PWM), PWM output: 6, Power consumption: 19ma, PCB size: 18x45mm, Weight: 7g, Product code: a000005



Fig -2: Arduino NANO

**Colour Sensor :** TCS3200 color sensor gy-31 TCS230 module for Arduino, arm and other MCU high-resolution conversion of light intensity to frequency programmable color and full-scale output frequency power down feature communicates directly to microcontroller s0~s1: Output frequency scaling selection inputs s2~s3: Photodiode type selection inputs out pin: Output Table frequency1 supply voltages up to 5v. : Input voltage: (2.7V to 5.5V) Working temperature: -40 deg C to 85 deg C Size: 28.4 x 28.4 mm (1.12x1.12") Programmable color and full-scale output frequency .



Fig -3: Color Sensor

**Servo Motors:** Aptech deals with SG90 micro servo motor 9g rc robot helicopter airplane boat controls (1pc) - get this micro servo motor 9g rc robot helicopter airplane boat controls. Operating speed: 0.12second/ 60degree ( 4.8v no load). Stall torque (4.8v): 17.5oz /in (1kg/cm) .



Fig -4: Servo Motor

**Jump Wires:** Length: 200mm, Weight: 25 gm. 1p-1p pin header, Male to Female, A row of 40 root Compatible with 2.54 mm spacing pin headers, 40pcs chromatic male to female color jump wire .



Fig -5: Jump Wires

**Switch :** Rating: AC 250V/16A 125V/20A, Contact Type: DPDT, On/Off/On; Pins: 6, size : 31 x 25 x 29 (L X B X H) mm, Material: Plastic, Metal; Package Content: 2pcs x 3 way Rocker Switch



Fig -6: Switch

#### 3.2. BLOCK DIAGRAM

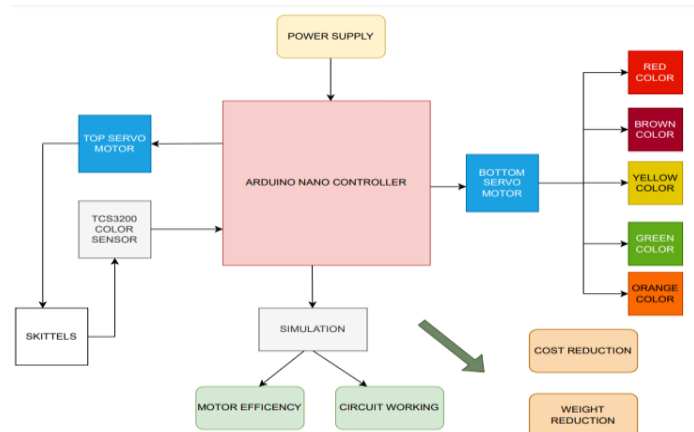


Fig -7: Block Diagram Of System

## 4. ASSEMBLY

### 4.1.CIRCUIT DIAGRAM

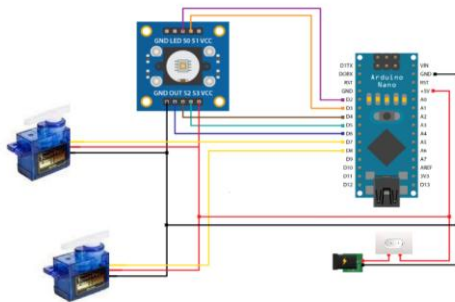


Fig -8: Circuit Diagram

In this circuit diagram we can see two servo motors, color sensor, Arduino & switch interfaced with each other. The black color lines in the diagram indicate that they are connected to the ground. The light-yellow lines from both servo motors are connected to D7 & D8 digital pins of Arduino respectively. The S0, S1, S2, S3 pins of the color sensor are connected to D2, D3, D4, D5 digital pins of Arduino respectively. The o/p of the color sensor is connected to the D6 digital pin of Arduino. The red lines show the voltage supply in the whole circuit. At the end it is connected to the power on/off switch to keep the circuit in working mode or in sleep mode.

### 4.2.MANUFACTURING AND TESTING DETAILS



Fig -9: 3D Printed Parts

We have used the FDM process for 3D printing our Slider, Rotary Platform, Guiding Rail and Slider Support. The material that we have used here is 9085 RESIN. It features a high strength-to-weight ratio, excellent heat resistance and high impact strength. It also possesses favorable flame, smoke and toxicity (FST) characteristics. Certified for high performance. ULTEM 9085 resin CG meets stringent test criteria.

From testing with following colors, range for different colors are as:

Brown[R(45-65), G(60-74)];  
 Green[R(43-56), B(51-61)];  
 Orange[R(30-43), B(45-59)];  
 Yellow[R(30-43), G(42-54)].

And also The angle movement for Top servo is 105°-42° - 12°-105° and for Bottom servo are 40°,75°,110°,145°. The output frequency scaling we used is 20% that is S0=H and S1=L.

## 5. RESULT AND CONCLUSION

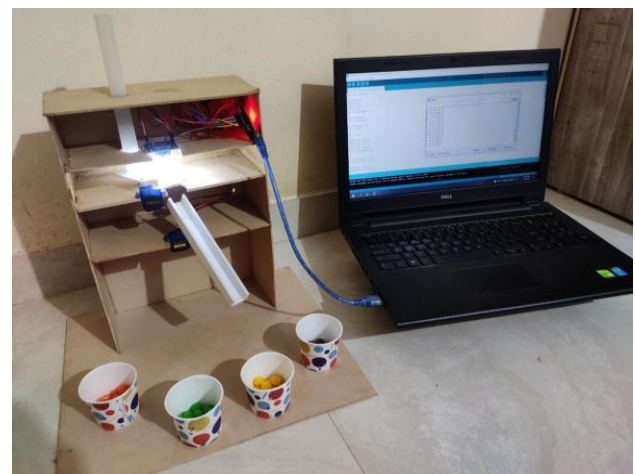


Fig -10: Final System

This system is able to recognize four different types of colored skittles using RGB values of the skittles in order to sort them based on the respective color. It takes 1.5 seconds time to sort one skittle which is less than the manual sorting. With this automatic sorting machine we can save time and labor cost very effectively. Though this system has some limitations, by having done some modification this concept can be implemented in a wide range of applications such as in Fruit Industries.

## 6. FUTURE SCOPE

It will be useful in a wide variety of industries in the packaging sector. This prototype can be customized by making changes in sensor and program. Some changes that can be made are like, by adding some sensors it will be useful in quality controlling and handling. We can add a display unit to get an accurate count of sorted objects. We can change the sensor according to the type of product. Adding load cells can give accurate weight of the product.

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